INPUT/OUTPUT SUMMARY TABLE -CHP ENERGY RECOVERY SYSTEM AND CHLLER PLANT CONTROLS

DESCRIPTION	INPUTS – ANALOG	INPUTS – BINARY	OUTPUTS – ANALOG	OUTPUTS – BINARY	OUTPUTS – 3- POINT FLOATING	ALARMS	FEATURES	REMARKS
OUTDOOR AIR TEMPERATURE (T-OA)	AIR TEMPERATURE						COLOR GRAPHICS, TREND LOG	
OUTDOOR AIR HUMIDITY (H-OA)	HUMIDITY						COLOR GRAPHICS, TREND LOG	
DEW POINT				AIR TEMPERATURE			COLOR GRAPHICS, TREND LOG	
RELATIVE HUMIDITY				HUMIDITY			COLOR GRAPHICS, TREND LOG	
CHILLER (65-CH-1)		STATUS	CHILLED WATER TEMP ST PT	START/STOP		RUN TIME	OPTIMIZED START (ADAPT.), REMOTE READ/RESET, COLOR GRAPHICS, TREND LOG	
CONDENSER WATER RETURN TEMPERATURE (T-8)	WATER TEMPERATURE					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHILLED WATER SUPPLY TEMP. (T-12)	WATER TEMPERATURE			2-POSITION VALVE MOD.		HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CONDENSER WATER ISOLATION VLV (CV-3)	POSITION INDICATION		MODULATING ACTUATOR, POSITION INDICATION FEEDBACK				COLOR GRAPHICS	
CHILLED WATER FLOW METER (FM-5)	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
HOT WATER ISOLATION VLV (CV-1)	POSITION INDICATION		MODULATING ACTUATOR, POSITION INDICATION FEEDBACK	2-POSITION VALVE MOD.			COLOR GRAPHICS	
CONDENSER WATER SUPPLY TEMPERATURE (T-9)	WATER TEMPERATURE					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHILLED WATER RETURN TEMP. (T-13)	WATER TEMPERATURE					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
HOT WATER RETURN TEMP. (T-4)	WATER TEMPERATURE					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
HOT WATER SUPPLY TEMP. (T-5)	WATER TEMPERATURE					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CONDENSER WATER FLOW METER (FM-3)	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
HOT WATER FLOW METER (FM-1)	FLOW			2-POSITION VALVE MOD.		LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHILLED WATER ISOLATION VLV (CV-5)	POSITION INDICATION		MODULATING ACTUATOR, POSITION INDICATION FEEDBACK				COLOR GRAPHICS	
CHILLED WATER FLOW SWITCH (FS-5)	FLOW	PROOF OF FLOW				LOSS OF FLOW	COLOR GRAPHICS	
CONDENSER WATER FLOW SWITCH (FS-3)	FLOW	PROOF OF FLOW				LOSS OF FLOW	COLOR GRAPHICS	
HOT WATER FLOW SWITCH (FS-1)	FLOW	PROOF OF FLOW				LOSS OF FLOW	COLOR GRAPHICS	
CHILLER (65-CH-2)		STATUS	CHILLED WATER TEMP ST PT	START/STOP		RUN TIME	OPTIMIZED START (ADAPT.), REMOTE READ/RESET, COLOR GRAPHICS, TREND LOG	
CONDENSER WATER RETURN TEMPERATURE (T-10)	WATER TEMPERATURE					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHILLED WATER SUPPLY TEMP. (T-14)	WATER TEMPERATURE			2-POSITION VALVE MOD.		HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CONDENSER WATER ISOLATION VLV (CV-4)	POSITION INDICATION		MODULATING ACTUATOR, POSITION INDICATION FEEDBACK				COLOR GRAPHICS	
CHILLED WATER FLOW METER (FM-6)	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
HOT WATER ISOLATION VLV (CV-2)	POSITION INDICATION		MODULATING ACTUATOR, POSITION INDICATION FEEDBACK	2-POSITION VALVE MOD.			COLOR GRAPHICS	
CONDENSER WATER SUPPLY TEMPERATURE (T-11)	WATER TEMPERATURE					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHILLED WATER RETURN TEMP. (T-15)	WATER TEMPERATURE					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
HOT WATER RETURN TEMP. (T-6)	WATER TEMPERATURE					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
HOT WATER SUPPLY TEMP. (T-7)	WATER TEMPERATURE					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CONDENSER WATER FLOW METER (FM-4)	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
HOT WATER FLOW METER (FM-2)	FLOW			2-POSITION VALVE MOD.		LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHILLED WATER ISOLATION VLV (CV-6)	POSITION INDICATION		MODULATING ACTUATOR, POSITION INDICATION FEEDBACK				COLOR GRAPHICS	
CHILLED WATER FLOW SWITCH (FS-6)	FLOW	PROOF OF FLOW				LOSS OF FLOW	COLOR GRAPHICS	
CONDENSER WATER FLOW SWITCH (FS-4)	FLOW	PROOF OF FLOW				LOSS OF FLOW	COLOR GRAPHICS	
HOT WATER FLOW SWITCH (FS-2)	FLOW	PROOF OF FLOW				LOSS OF FLOW	COLOR GRAPHICS	
COOLING COOLING TOWER (65-CT-1)		STATUS, VFD FAULT	4-20mA CONTROL	START/STOP		RUN TIME	COLOR GRAPHICS, TREND LOG	
COOLING TOWER ISOLATION VALVE (CV-8)	POSITION INDICATION		MODULATING ACTUATOR, POSITION INDICATION FEEDBACK				COLOR GRAPHICS	
COOLING TOWER FAN (CS-19) (65-VFD-CT-1)		END SWITCH		2-POSITION VALVE MOD.			COLOR GRAPHICS	
LEVEL SENSOR (LS-1)	WATER LEVEL					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
COOLING TOWER BY-PASS VALVE (CV-9)	POSITION INDICATION		MODULATING ACTUATOR, POSITION INDICATION FEEDBACK				COLOR GRAPHICS	
COOLING TOWER BLEED VALVE (CV-10)	POSITION INDICATION		MODULATING ACTUATOR, POSITION INDICATION FEEDBACK				COLOR GRAPHICS	
COOLING TOWER MAKE-UP VALVE (CV-11)	POSITION INDICATION		MODULATING ACTUATOR, POSITION INDICATION FEEDBACK				COLOR GRAPHICS	
MAKE-UP WATER FLOW METER (FM-7)	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
COOLING COOLING TOWER (65-CT-2)		STATUS, VFD FAULT	4-20mA CONTROL	START/STOP		RUN TIME	COLOR GRAPHICS, TREND LOG	
COOLING TOWER ISOLATION VALVE (CV-7)	POSITION INDICATION		MODULATING ACTUATOR, POSITION INDICATION FEEDBACK				COLOR GRAPHICS	
COOLING TOWER FAN (CS-20) (65-VFD-CT-2)		END SWITCH		2-POSITION VALVE MOD.			COLOR GRAPHICS	
LEVEL SENSOR (LS-2)	WATER LEVEL					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CONDENSER WATER BLEED METER (FM-15)	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHP HOT WATER PUMPS								
HOT WATER PUMP 65-P-1 (CS-1)		STATUS	4-20mA CONTROL	START/STOP			COLOR GRAPHICS, TREND LOG	
HOT WATER PUMP 65-P-2 (CS-2)		STATUS	4-20mA CONTROL	START/STOP			COLOR GRAPHICS, TREND LOG	
HOT WATER PUMP 65-P-3 (CS-3)		STATUS	4-20mA CONTROL	START/STOP			COLOR GRAPHICS, TREND LOG	
HOT WATER PUMP 65-P-4 (CS-4)		STATUS	4-20mA CONTROL	START/STOP			COLOR GRAPHICS, TREND LOG	
HOT WATER PUMP 65-P-5 (CS-5)		STATUS	4-20mA CONTROL	START/STOP			COLOR GRAPHICS, TREND LOG	
HOT WATER PUMP 65-P-6 (CS-6)		STATUS	4-20mA CONTROL	START/STOP			COLOR GRAPHICS, TREND LOG	
ABSORPTION CHILLERS HOT WATER PUMPS								
HOT WATER PUMP 65-P-7 (CS-7)		STATUS	4-20mA CONTROL	START/STOP		RUN TIME	COLOR GRAPHICS, TREND LOG	
HOT WATER PUMP 65-P-8 (CS-8)		STATUS	4-20mA CONTROL	START/STOP		RUN TIME	COLOR GRAPHICS, TREND LOG	
HOT WATER PUMP 65-P-9 (CS-9)		STATUS	4-20mA CONTROL	START/STOP		RUN TIME	COLOR GRAPHICS, TREND LOG	
CAMPUS HEATING HOT WATER PUMPS								
HOT WATER PUMP 65-P-10 (CS-10) (65-VFD-P-10)		STATUS, VFD FAULT	4-20mA CONTROL	START/STOP, SMOKE INTERLOCK		RUN TIME	COLOR GRAPHICS, TREND LOG	
HOT WATER PUMP 65-P-11 (CS-11) (65-VFD-P-11)		STATUS, VFD FAULT	4-20mA CONTROL	START/STOP, SMOKE INTERLOCK		RUN TIME	COLOR GRAPHICS, TREND LOG	
HOT WATER FLOW METER (FM-8)	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
DIFFERENTIAL PRESSURE SENSOR (DP-1)	DIFF. PRESSURE SENSOR (DPS)					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHILLED WATER PUMPS								
CHILLED WATER PUMP 65-P-12 (CS-12)		STATUS	4-20mA CONTROL	START/STOP		RUN TIME	COLOR GRAPHICS, TREND LOG	
CHILLED WATER PUMP 65-P-13 (CS-13)		STATUS	4-20mA CONTROL	START/STOP		RUN TIME	COLOR GRAPHICS, TREND LOG	
CHILLED WATER PUMP 65-P-14 (CS-14)		STATUS	4-20mA CONTROL	START/STOP		RUN TIME	COLOR GRAPHICS, TREND LOG	
CHILLED WATER PUMP 65-P-15 (CS-15)		STATUS	4-20mA CONTROL	START/STOP		RUN TIME	COLOR GRAPHICS, TREND LOG	
CONDENSER WATER PUMPS								
CONDENSER WATER PUMP 65-P-16 (CS-16)		STATUS	4-20mA CONTROL	START/STOP		RUN TIME	COLOR GRAPHICS, TREND LOG	
CONDENSER WATER PUMP 65-P-17 (CS-17)		STATUS	4-20mA CONTROL	START/STOP		RUN TIME	COLOR GRAPHICS, TREND LOG	
CONDENSER WATER PUMP 65-P-18(CS-18)		STATUS	4-20mA CONTROL	START/STOP		RUN TIME	COLOR GRAPHICS, TREND LOG	

Column headings of the table: INPUTS – ANALOG: WATER TEMPERATURE, AIR TEMPERATURE, HUMIDITY, POSITION INDICATION, DIFF. PRESSURE SENSOR (DPS), KW, FLOW, WATER LEVEL; INPUTS – BINARY: WATER LEVEL (4 STAGE), WATER LEVEL (1 STAGE), STATUS, PROOF OF FLOW, DIFF. PRESSURE SWITCH (DP), VFD FAULT, END SWITCH; OUTPUTS – ANALOG: CHILLED WATER TEMP ST PT, MODULATING ACTUATOR, E/P TRANSDUCER, 4-20mA CONTROL, POSITION INDICATION FEEDBACK; OUTPUTS – BINARY: CONTROL RELAY, SOLENOID, START/STOP, 2-POSITION VALVE MOD., SMOKE INTERLOCK, AIR TEMPERATURE, HUMIDITY; 3- POINT FLOATING: ACTUATOR, MERCURY RELAY, FEED/BLEED SAV; ALARMS: HIGH LIMIT, LOW LIMIT, RUN TIME, MAINTENANCE MESSAGE, LOSS OF FLOW, HIGH WATER ALARM; FEATURES: SCHEDULED START/STOP, TEMPERATURE SETBACK/SETUP, OPTIMIZED START (ADAPT.), DEMAND LIMITING, DUTY CYCLE, VENTILATION DELAY, ECONOMIZER CYCLE (D.B.), H.W. RESET W/O.A. TEMPERATURE, VAV CONTROL, REMOTE READ/RESET, TENANT OVERRIDE, COLOR GRAPHICS, POINT LOCKOUT, TREND LOG; REMARKS.

CHP ENERGY RECOVERY SYSTEM AND CHILLER PLANT CONTROLS

INPUT/OUTPUT SUMMARY TABLE -CHP ENERGY RECOVERY SYSTEM AND CHLLER PLANT CONTROLS

DESCRIPTION	INPUTS – ANALOG	INPUTS – BINARY	OUTPUTS – ANALOG	OUTPUTS – BINARY	OUTPUTS – 3- POINT FLOATING	ALARMS	FEATURES	REMARKS
CHP HEAT EXCHANGER-1 (T-1)	WATER TEMPERATURE					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHP HEAT EXCHANGER-2 (T-2)	WATER TEMPERATURE					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHP HEAT EXCHANGER-3 (T-3)	WATER TEMPERATURE					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
HEAT EXCHANGER 65-2W-HX-1 SUPPLY TEMPER. (T-21)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCHANGER 65-2W-HX-1 CONTROL VALVE (CV-12)	POSITION INDICATION		MODULATING ACTUATOR				COLOR GRAPHICS	
HEAT EXCH.(2W-C1, 2W-C2)HOT WATER RETURN TEMP.(T-22)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCH.(2W-C1, 2W-C2)HOT WATER RETURN TEMP.(T-23)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCHANGER 65-2W-HX-1 RETURN TEMPER. (T-24)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCHANGER 65-2W-HX-2 SUPPLY TEMPER. (T-25)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCHANGER 65-2W-HX-2 CONTROL VALVE (CV-13)	POSITION INDICATION		MODULATING ACTUATOR				COLOR GRAPHICS	
HEAT EXCH.(2W-C3, 2W-C4)HOT WATER RETURN TEMP.(T-26)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCH.(2W-C3, 2W-C4)HOT WATER RETURN TEMP.(T-27)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCHANGER 65-2W-HX-2 RETURN TEMPER. (T-28)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCHANGER 65-2W-HX-3 SUPPLY TEMPER. (T-29)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCHANGER 65-2E-HX-3 CONTROL VALVE (CV-14)	POSITION INDICATION		MODULATING ACTUATOR				COLOR GRAPHICS	
HEAT EXCH.(2E-C1, 2E-C2)HOT WATER RETURN TEMP.(T-30)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCH.(2E-C1, 2E-C2)HOT WATER RETURN TEMP.(T-31)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCHANGER 65-2W-HX-3 RETURN TEMPER. (T-32)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCHANGER 65-2W-HX-4 SUPPLY TEMPER. (T-33)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCHANGER 65-2E-HX-4 CONTROL VALVE (CV-15)	POSITION INDICATION		MODULATING ACTUATOR				COLOR GRAPHICS	
HEAT EXCH.(2E-C3, 2E-C4)HOT WATER RETURN TEMP.(T-34)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCH.(2E-C3, 2E-C4)HOT WATER RETURN TEMP.(T-35)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCHANGER 65-2W-HX-4 RETURN TEMPER. (T-36)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEAT EXCH.(2W-HX-C1,C2)3-WAY CONTROL VALVE (CV-16)	POSITION INDICATION		MODULATING ACTUATOR				COLOR GRAPHICS	
HEAT EXCH.(2W-HX-C3,C4)3-WAY CONTROL VALVE (CV-17)	POSITION INDICATION		MODULATING ACTUATOR				COLOR GRAPHICS	
HEAT EXCH.(2E-HX-C1,C2)3-WAY CONTROL VALVE (CV-18)	POSITION INDICATION		MODULATING ACTUATOR				COLOR GRAPHICS	
HEAT EXCH.(2E-HX-C3,C4)3-WAY CONTROL VALVE (CV-19)	POSITION INDICATION		MODULATING ACTUATOR				COLOR GRAPHICS	
PUMP CONTROLLING DP SENSOR AND BY-PASS VALVE								
DIFF. PRESS. CONTROLLING SENSOR (DPS-1)	DIFF. PRESSURE SENSOR (DPS)					HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS, TREND LOG	
DIFF. PRESS. BY-PASS VALVE (CV-20)	POSITION INDICATION		POSITION INDICATION FEEDBACK				COLOR GRAPHICS	
CAMPUS CHILLED WATER SUPPLY TEMPERATURE (T-16)	WATER TEMPERATURE		CHILLED WATER TEMP ST PT			HIGH LIMIT	COLOR GRAPHICS, TREND LOG	
CAMPUS CHILLED WATER RETURN TEMPERATURE (T-17)	WATER TEMPERATURE		CHILLED WATER TEMP ST PT			HIGH LIMIT	COLOR GRAPHICS, TREND LOG	
HEATING SYSTEM (BLDG. 2E AND 2W) RETURN TEMP. (T-18)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEATING SYSTEM (BLDG. 2E AND 2W) RETURN TEMP. (T-19)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
HEATING SYSTEM (BLDG. 2E AND 2W) SUPPLY TEMP. (T-20)	WATER TEMPERATURE						COLOR GRAPHICS, TREND LOG	
GENERATOR COMBUSTION AIR INTAKE TEMPERATURE (T-37)	WATER TEMPERATURE		CHILLED WATER TEMP ST PT			HIGH LIMIT	COLOR GRAPHICS, TREND LOG	
GENERATOR INTERCOOLER CIRCUTE CONTROL VALVE (CV-20)	POSITION INDICATION		MODULATING ACTUATOR				COLOR GRAPHICS	
GENERATOR COMBUSTION AIR INTAKE TEMPERATURE (T-38)	WATER TEMPERATURE		CHILLED WATER TEMP ST PT			HIGH LIMIT	COLOR GRAPHICS, TREND LOG	
GENERATOR INTERCOOLER CIRCUTE CONTROL VALVE (CV-21)	POSITION INDICATION		MODULATING ACTUATOR				COLOR GRAPHICS	
GENERATOR COMBUSTION AIR INTAKE TEMPERATURE (T-39)	WATER TEMPERATURE		CHILLED WATER TEMP ST PT			HIGH LIMIT	COLOR GRAPHICS, TREND LOG	
GENERATOR INTERCOOLER CIRCUTE CONTROL VALVE (CV-22)	POSITION INDICATION		MODULATING ACTUATOR				COLOR GRAPHICS	
EXISTING CHILLER 2W-CH-1 CHILLED WATER METER FM-9	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
EXISTING CHILLER 2W-CH-2 CHILLED WATER METER FM-10	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
EXISTING CHILLER 2W-CH-3 CHILLED WATER METER FM-11	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
EXISTING CHILLER 2W-GH-1 CONDENSER WATER METER FM-12	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
EXISTING CHILLER 2W-GH-2 CONDENSER WATER METER FM-13	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
EXISTING CHILLER 2W-GH-3 CONDENSER WATER METER FM-14	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHILLER PLANT BTU METER	FLOW					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
ENG-1 EMISSION SENSOR ES-1						HIGH LIMIT		
ENG-2 EMISSION SENSOR ES-2						HIGH LIMIT		
ENG-3 EMISSION SENSOR ES-3						HIGH LIMIT		
CHP-1 HEAT EXCHANGER HOT WATER TEMP. SENSOR T-40	WATER TEMPERATURE					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHP-2 HEAT EXCHANGER HOT WATER TEMP. SENSOR T-41	WATER TEMPERATURE					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
CHP-3 HEAT EXCHANGER HOT WATER TEMP. SENSOR T-42	WATER TEMPERATURE					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
HOT WATER RETURN TEMP. SENSOR T-43	WATER TEMPERATURE					LOW LIMIT	COLOR GRAPHICS, TREND LOG	
DOMESTIC HOT WATER FLOW	FLOW	PROOF OF FLOW				LOSS OF FLOW	COLOR GRAPHICS	SEE DWG. PP-502
DOMESTIC HOT WATER HEATER WATER TEMPERATURE						HIGH LIMIT, LOW LIMIT	COLOR GRAPHICS	SEE DWG. PP-502
SEWAGE EJECTOR WATER LEVEL						HIGH LIMIT	COLOR GRAPHICS	SEE DWG. PP-201
DOMESTIC HOT WATER SUPPLY TEMP. SENSOR T-43	WATER TEMPERATURE					LOW LIMIT	COLOR GRAPHICS, TREND LOG	SEE DWG. MI-100
DOMESTIC HOT WATER RETURN TEMP. SENSOR T-44	WATER TEMPERATURE					LOW LIMIT	COLOR GRAPHICS, TREND LOG	SEE DWG. MI-100
DOMESTIC HOT WATER GAS SUB-METER	FLOW						COLOR GRAPHICS, TREND LOG	SEE DWG. PP-201
DOMESTIC USE COLD WATER SUB-METER	FLOW						COLOR GRAPHICS, TREND LOG	SEE DWG. PP-201
DOMESTIC USE COLD WATER SUB-METER	FLOW						COLOR GRAPHICS, TREND LOG	SEE DWG. PP-201
CHP EQUIPMENT GAS FLOW SUB-METER	FLOW						COLOR GRAPHICS, TREND LOG	SEE DWG. PP-201
OFFICE EQUIPMENT GAS FLOW SUB-METER	FLOW						COLOR GRAPHICS, TREND LOG	SEE DWG. PP-201
NON-POTABLE COLD WATER SUB-METER	FLOW						COLOR GRAPHICS, TREND LOG	SEE DWG. PP-201

THE EXISTING SIEMENS CAMPUS BUILDING MANAGEMENT AND CONTROL SYSTEM (BMS) WILL BE EXPANDED TO INCLUDE THE FOLLOWING FUNCTIONS:

- MONITORING OPERATION OF THE CHP PLANT
- MONITORING AND CONTROL OPERATION OF THE NEW CHILLER PLANT WITH ABSORPTION CHILLERS AND EXISTING CHILLER PLANT
- MONITORING AND CONTROL OF THE ADDED HEAT EXCHANGERS TO THE HEATING SYSTEMS OF BUILDINGS 2W AND 2E.

COOLING SEASON SEQUENCE OF OPERATION (CHILLED WATER PLANT IS ENABLED):

NEW ABSORPTION CHILLERS 65-CH-1 AND 65-CH-2-SHALL OPERATE ON A LEAD/LAG ROTATION BASIS FOR EQUAL RUN TIME. WHEN AT LEAST ONE CHP PLANT GENERATOR IS RUNNING, THE ABSORPTION CHILLER PLANT SHALL BE SET AS A LEAD PLANT BETWEEN EXISTING CHILLER PLANT AND THE NEW ONE.

WHEN AT LEAST ONE CHP PLANT GENERATOR IS RUNNING, THE LEAD ABSORPTION CHILLER SHALL BE ENABLED. CHILLED WATER, CONDENSER WATER AND HOT WATER ISOLATION VALVES SHALL OPEN, THE CORRESPONDING HOT WATER, PRIMARY CHILLED AND CONDENSER WATER PUMPS SHALL START, AND THE COOLING TOWER SEQUENCE SHALL BE STARTED. ONCE PROOF OF CHILLED, HOT AND CONDENSER WATER FLOW IS ESTABLISHED, AND HOT WATER TEMPERATURE (FROM CHP HEAT EXCHANGER) IS AT 200°F (AS SENSED BY RESPECTIVE TEMPERATURE SENSORS T-1, T-2 OR T-3), THE LEAD CHILLER (65-CH-1 OR 65-CH-2) WILL BE COMMANDED TO START AND MODULATE ITS CONTROLS TO MAINTAIN A 42°F (ADJ) LEAVING CHILLED WATER TEMPERATURE.

THE CAMPUS BUILDING MANAGEMENT CONTROL SYSTEM SHALL MONITOR CHILLED WATER SYSTEM SUPPLY AND RETURN WATER TEMPERATURES. ON A RISE OF SYSTEM RETURN WATER TEMPERATURE ABOVE 54°F SETPOINT (ADJUSTABLE), AND IF THE SECOND GENERATOR IS RUNNING, THE LAG ABSORPTION CHILLER SHALL BE ENABLED. CHILLED WATER, CONDENSER WATER AND HOT WATER ISOLATION VALVES SHALL OPEN, THE CORRESPONDING HOT WATER, PRIMARY CHILLED AND CONDENSER WATER PUMPS SHALL START, AND THE COOLING TOWER SEQUENCE SHALL BE STARTED. ONCE PROOF OF CHILLED, HOT AND CONDENSER WATER FLOW IS ESTABLISHED, AND HOT WATER TEMPERATURE (FROM CHP HEAT EXCHANGER) IS AT 200°F, THE LAG CHILLER (65-CH-1 OR 65-CH-2) WILL BE COMMANDED TO START AND MODULATE ITS CONTROLS TO MAINTAIN A 42°F (ADJ) LEAVING CHILLED WATER TEMPERATURE IN PARALLEL WITH LEAD CHILLER.

IF ON THE RISE OF THE RETURN CHILLED WATER TEMPERATURE ABOVE SETPOINT, THE SECOND GENERATOR IS NOT RUNNING, THE LEAD ELECTRICAL CHILLER SHALL BE COMMANDED TO START AND WILL FOLLOW ITS EXISTING SEQUENCE OF OPERATION. AS CAMPUS COOLING LOAD INCREASES, EACH CONSECUTIVE EXISTING CHILLER WILL BE COMMANDED TO START AND TO FOLLOW THE EXISTING SEQUENCE OF OPERATION INCLUDING ASSOCIATED PUMPS AND COOLING TOWERS SEQUENCES.

IF DURING THE OPERATION OF THE EXISTING ELECTRIC CHILLERS THE SECOND GENERATOR COMES ON LINE, THE PRIORITY SHALL BE SWITCHED TO THE LAG ABSORPTION CHILLER VS ELECTRIC CHILLER AND LAG ABSORPTION CHILLER SEQUENCE OF OPERATION SHALL BE INITIATED. THE ELECTRIC CHILLERS SHALL BE SEQUENCED TO START AS NEEDED TO SUPPORT CAMPUS COOLING LOAD.

WHEN THE LEAD ABSORPTION CHILLER IS FAILED TO START AS DIRECTED, THE LAG ABSORPTION CHILLER AND ASSOCIATED PUMPS AND CONTROL VALVES SHALL BE ENABLED AND ALARM SENT TO CAMPUS BMS.

IF ANY OF THE CHP PLANT PUMPS FAILSTO START WHEN COMMANDED, THE CORRESPONDING STAND-BY PUMP SHALL START AND ALARM SENT TO CAMPUS BMS.

COOLING TOWERS 65-CT -1 AND 65-CT-2 SHALL OPERATE ON A LEAD/LAG ROTATING BASIS FOR EQUAL RUN TIME. WHEN THE COOLING TOWER IS COMMANDED TO START, THE RESPECTIVE ISOLATION VALVE SHALL OPEN AND CONDENSER WATER PUMP SHALL START. COOLING TOWER CONTROLS SHALL MODULATE VFD ON THE COOLING TOWER FAN AND BY-PASS CONTROL VALVE IN SEQUENCE TO MAINTAIN SUPPLY CONDENSER WATER TEMPERATURE SETPOINT 85°F (ADJ).

WHEN THE FLOAT SWITCH ON ANY OF THE NEW COOLING TOWERS GETS A SIGNAL FROM THE RESPECTIVE LEVEL SENSOR ON THE LOW WATER LEVEL, NORMALLY CLOSED TWO POSITION VALVE ON THE MAKE-UP WATER LINE SHALL OPEN.
IF THE LEAD COOLING TOWER FAILS TO START WHEN DIRECTED, THE LAG COOLING TOWER AND ASSOCIATED PUMPS AND CONTROL VALVE SHALL START AND ALARM SHALL BE SENT TO THE BMS.

WHEN AT LEAST ONE CHP GENERATOR IS RUNNING AND CHP HOT WATER RETURN TEMPERATURE SENSOR T-36 INDICATES WATER TEMPERATURE ABOVE 190°F (ADJUSTABLE), THE HOT WATER PUMP (65-P-10 OR 65-P-11) SHALL START. PUMP'S VFD (65-VFD-1 OR 65-VFD-2) SHALL MODULATE THE PUMP FLOW TO MAINTAIN HOT WATER SYSTEM PRESSURE SETPOINT.

HEATING SEASON SEQUENCE OF OPERATION (CHILLED WATER PLANT IS DISABLED):

WHEN AT LEAST ONE CHP PLANT GENERATOR IS RUNNING, THE HOT WATER PUMP (65-P-10 OR 65-P-11) SHALL START. PUMP'S VFD (65-VFD-1 OR 65-VFD-2) SHALL MODULATE THE PUMP FLOW TO MAINTAIN HOT WATER SYSTEM PRESSURE SETPOINT. WHEN VFD IS AT ITS MENIMUM SPEED, THE PRESSURE DIFFERENTIAL BY-PASS CONTROL VALVE SHALL MODULATE TOWARDS ITS OPEN POSITION TO MAINTAIN SYSTEM PRESSURE SETPOINT.
IF LEAD PUMPS FAILS TO START, THE LAG PUMP SHALL START AND ALARM SIGNAL SHALL BE SENT TO BMS.

HEAT EXCHANGER CONTROL IN BUILDINGS 2W AND 2E:
WHEN EXISTING HOT WATER OR HOT WATER/GLYCOL SYSTEM IS OPERATIONAL (AT LEAST ONE OF THE SYSTEM PUMPS IS RUNNING), AND RETURN HOT WATER TEMPERATURE (AS SENSED BY T-23,T-26, T-30 AND T-34) IS LESS THAN SUPPLY HOT WATER TEMPERATURE SETPOINT IN THE EXISTING SYSTEM, THE RESPECTIVE THREE WAY CONTROL VALVE (CV-16,CV-17, CV-18 AND CV-19) SHALL DIVERT THE RETURN WATER FLOW TO THE NEW HOT WATER HEAT EXCHANGERS (65-2W-HX-1, 65-2W-HX-2, 65-2E-HX-3, 65-2E-HX-4). CONTROL VALVES ON THE "HOT" SIDE OF THE HEAT EXCHANGERS (CV-12, CV-13, CV-14 AND CV-15) SHALL MODULATE TO MAINTAIN SUPPLY EXISTING HOT WATER TEMPERATURE SETPOINT (T-22, T-27, T-31 AND T-35) AS IT IS SET BY THE EXISTING SYSTEM CONTROLS.

FULLY SPRINKLERED

BID DOCUMENTS

No.	Description	Date
A 01	ADDENDUM NO. 1	08/14/13

REVISIONS

CONSULTANTS:

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Drawing Title: CHP PLANT CONTROL POINTS AND SEQUENCE OF OPERATION

Approved: Project Director

Project Title: COMBINED HEAT AND POWER PLANT AT THE NEWINGTON, CT VA

Project Number: VA701-13-J-0023

Building Number:

Location: 555 WILLARD AVENUE, NEWINGTON, CT 06111

Drawing Number: MI102

Date: 07/19/2013 | Checked: AK | Drawn: IER

PROGRAM CONTRACTING ACTIVITY CENTRAL

Department of Veterans Affairs

VA FORM 08-6231, Oct 1978

three inch = one foot; one and one half inch = one foot; one inch = one foot; three quarter inch = one foot; one half inch = one foot; three eigths inch = one foot; one quarter inch = one foot; one eighth inch = one foot